National Grid

Engineering/Design Procedure

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1.0 INTRODUCTION

The objective in preparing a Project Estimate is to establish the total project cost, expenditures over time, and manpower requirements. This "Project Estimating Guide" has been prepared to assist the Project Engineer in attaining this objective.

Project Estimate information is required to:

- Furnish cost information for management approval
- Prepare manpower and cost budgets

It is vital that this information be as accurate as practicable.

Each engineering department may have supplemental requirements for their department.

2.0 GENERAL INFORMATION

2.1.1 Order of Magnitude Estimate

An ORDER OF MAGNITUDE ESTIMATE is based on a very generalized understanding of the project and assumes little or no investigation prior to preparation. It is generally based on the engineer's judgment and is used in the very early stages of management or planning studies. Decisions contingent on ORDER OF MAGNITUDE ESTIMATES relate only to the broad economic viability of a project and whether to embark on or continue to develop further details.

ORDER OF MAGNITUDE ESTIMATES have a low level of accuracy.

2.1.2 Study Estimate

A STUDY ESTIMATE is based on a conceptual understanding of a project. It is used, along with companion estimates, to compare alternate plans. STUDY ESTIMATES for all of the alternatives of a given study should be prepared at the same time and based on common criteria.

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STUDY ESTIMA TES are prepared using historical cost data, data from similar projects and other stated assumptions. They are prepared to ensure that they would be within ±25% of the final project cost. If available data, time or other circumstances prevent the generation of estimates accurate within ±25% the requestor shall be so informed. Sensitivity studies may be required in evaluations using STUDY ESTIMATES.

If a STUDY ESTIMATE is provided to outside organizations, the engineer providing the estimate must make sure the recipient of the estimate is clearly aware that it is a STUDY ESTIMATE and not suitable for finalizing agreements, contracts or commitments.

2.1.3 Project Estimate

A PROJECT ESTIMATE is based on a detailed project scope. General layouts, block diagrams, flow diagrams, and time schedules are normally available prior to, or developed with, the PROJECT ESTIMATE.

The PROJECT ESTIMATE is prepared using detailed material, labor and overhead breakdowns and is used to obtain project authorization. The Project Engineer shall conduct site inspections, studies, and discussions which will enhance the accuracy of the estimate, paying particular attention to those aspects of the project which may have a high degree of uncertainty .S/he is to reach consensus with all departments making a contribution to the implementation of the project so that the estimate accurately reflects their portion of involvement.

The Project Engineer shall develop the total engineering portion of the PROJECT ES TIMA TE. Managers of all engineering departments shall review and approve their portion. An estimate of the construction labor portion shall be made by the Project Engineer. This estimate will be submitted to the department responsible for construction for review and ultimate approval as the final construction portion.

Construction is accomplished by one or a combination of: (1) Operating Company personnel, (2) NEPSCO Construction Services personnel, (3) Outside Contractors and Outside Building Trades. Prior to the preparation of an estimate, the Project Engineer will contact the appropriate departments for a determination of who will do the construction.

The Project Engineer and appropriate department head initial the summary sheet indicating their acceptance of overall responsibility for the estimate and associated construction schedule (EDP- GEN-4 "Project Scheduling Guide").

2.2 Account Classification

The Project Engineer shall be responsible for the accuracy of the Plant Unit Codes used in the project estimate.

Any additions or deletions to the Plant Unit codes must be approved by the Project Engineer.

2.3 Project Changes

During the course of a project, changes in various aspects of the project may be warranted. To control and maintain accurate records on these changes, no changes that affect the scope, cost, or schedule of a project shall be made without prior authorization of the Project Engineer.

Changes shall be recorded, with approvals, on a "Project Change Order" .The completed "Project Change Order" shall be submitted to the department head that originated the change for approval before authorization by the Project Engineer.

2.4 Estimate and Project Revisions

If there is any indication that the project will overrun the allowable variance, a revised estimate and project sheet shall be prepared.

A revised estimate and project sheet shall also be prepared for changes to the scope defined in the original project estimate.

The following accounting limits have been established for approval of additional spending.

ESTIMATED COST	ALLOWABLE VARIANCE
$10,000 to $50,000	$10,000
$50,001 to $125,000	20%
$125,001 to $250,000	$25,000
$250,001 to $1,000,000	10%
$1,000,001 to $2,000,000	$100,000
$2,000,000 and above	5%

3.0 GENERAL INFORMATION

3.1 Material

3.1.1 Directly Purchased Material

The cost of directly purchased material can be obtained from manufacturer's catalogs or representatives, or from recent purchases for other projects.

Escalation should be applied to directly purchased materials unless the price in the material contract is firm. Escalation should be applied to the time shipment is expected.

3.1.2 Stores Material

The latest unit cost for any item in Company Stores can be obtained from the Walker Purchasing, Materials, Payables (PMP) System.

On retail company overhead distribution line projects under 69 kV, an imprest stock allocation charge is applied to most material issued from Company Stores.

3.1.3 Sales Tax

State sales tax must be added to directly purchased material costs as follows:

1. **Rhode Island** -Tax rate is 7% on all material. (See Rhode Island Sales and Use Tax/Corporate Tax Manual as of 5/1/96 for further details)

2. **Massachusetts** -Tax rate is 5%. Purchases are taxable or exempt depending on plant account classification. Refer to Exhibit D of the NEPSCO Corporate Tax Manual/Massachusetts Sales and Use Tax for a listing of non-exempt items in each Plant Unit Code.

3. **New Hampshire** – No sales tax.

4. **Vermont** – Tax rate is 4% on all material.

3.2 Labor – Engineering, Design and Supervision

The Project Engineer shall develop the total project engineering direct labor cost with input from all engineering departments involved in the project. Managers of contributing departments shall review and approve their portion.

Quality assurance is the overall responsibility of the Project Engineer. Costs should include the following:

1. Plant inspection for quality assurance of vendor produced equipment or materials in accordance with project specifications.

2. Job site inspection of construction to assure conformance with project drawings and specifications.

3.3 Labor – Construction

In estimating staff hour requirements, the following factors should be considered:

1. Crew Size
2. Working conditions
   - Indoor or outdoor
   - Winter or summer
   - Accessibility and closeness of working area
   - Proximity to energized equipment
   - Switching required
   - Specialized skills (drivers, certified welders, etc.)
   - Unit outages
3. Startup costs
4. NEPSCo and retail company startup and preliminary operation charges
5. Preparation and cleanup
6. Age of station or facility
7. Alignment, calibration, and checkout of instrumentation, relays, meters, and controls
8. Shift work
9. Weekend Work
10. Overtime

4.0 OVERHEAD COSTS

4.1 Material Overhead Costs

A store's handling charge is applied to all material issued from Company Stores.

The unit cost obtained from PMP does not contain the stores handling charge. Stores handling charges are also applied to imprest stock material costs.

4.2 Engineering, Design and Supervision Overhead Costs

NEPSCo overhead costs include time not worked, group insurance, unemployment compensation, pension annuity costs, Service Company operational costs, personal expense and transportation. These overhead costs are automatically added to any NEPSCo direct labor payroll cost charged to a project.

4.3 Construction Overhead Labor Costs

NEPSCo Construction Services' hourly overhead costs include time not worked, use of tools, insurance, taxes and expenses.

When an Operating Company performs work for outside parties or associated companies, a 15% administrative and supervision charge is added to the total of direct labor and overhead costs.

5.0 OTHER COSTS

5.1 Vehicles and Equipment Costs

The use of company vehicles, construction equipment and rental equipment must be estimated separately.

5.2 Outside Services – Contractors

All labor, services and rental equipment supplied by outside contractors as well as material furnished and installed by outside contractors should be estimated separately.

5.3 Preliminary Engineering

New England Power Service Company preliminary engineering costs should include the total amount that wiIl accumulate on project work orders.

On Retail Company estimates, preliminary engineering costs are provided by District Engineering.

5.4 General and Administrative Costs

General and Administrative costs of the operating companies are distributed among the projects in progress according to the total cost of the project.

5.5 Allowance for Funds Used During Construction (AFUDC)

AFUDC is applied against a project from the tin1e the project status becomes "approved" until the Manager of Plant Accounting is notified that the equipment installed is ready for service. It is not necessary that the equipment be energized, carry load, or be utilized in order to stop AFUDC charges. AFUDC charges for a portion of a project ready for service can also be stopped.

The budget analyst issues a monthly project status report identifying "ready for service dates, “completion" dates, and intermediate progress on both milestones.

No AFUDC is charged on preliminary engineering. When and if a project is approved, the associated preliminary engineering dollars are transferred to project capital cost. Plant Accounting, at that time, calculates the retroactive AFUDC on preliminary engineering costs and adds this to the capital project as an AFUDC charge.

No allowance for AFUDC is applied on blanket authorizations, customers' meters, line transformers, building renovations, street lights, feeder conversions, in-service reconductoring and items of general equipment such as furniture, autos or other property ready for service when purchased.

AFUDC is calculated on a quarterly basis. One fourth of the annual AFUDC rate is applied each quarter to the average expenditure for the quarter (computed as one-half the total expenditure for the quarter) plus the total accumulated expenditures for all prior quarters. An example using an AFUDC rate of 8.8% follows:

Amount Spent During Quarter	Calculation		AFUDC
1st Qtr. - $25,000	(0+$25,000/2)x2.2%	=	$275
2nd Qtr. - $85,000	($25,000+$85,000/2)x2.2%	=	$1,485
3rd Qtr. - $65,000	($110,000+$65,000/2)x2.2%	=	$3,135
4th Qtr. - $8,000	($175,000+$8,000/2)x2.2%	=	$3,938
TOTAL $183,000	TOTAL	=	$8,833

5.6 Contingency

Contingency is an allowance in each estimate to cover indetenninate items, minor changes, and variations in units ofwork and material. The amount of contingency should be based on the degree of confidence in the estimate. Typical contingencies are:

Material - 10%
Labor - 15%

Some projects have a high degree of uncertainty due to:

- Subsurface or sub aqueous construction
- Transmission switching
- Incomplete records
- Retrofits

For these projects, specific increased contingency allocations for the items having an unusual amount of uncertainty should be identified and addressed.

5.7 Miscellaneous and Supervisory Accounts (NEPSCo and Operating Companies)

5.7.1 Miscellaneous (formerly Account 093.1000)

Many miscellaneous costs are not directly chargeable to a specific Plant Unit Code. These costs, which generally an1ount to 5% to 10% of the construction direct labor cost, should be estimated separately and charged to a spread account. Several distinct activity numbers have been established for charges to miscellaneous accounts. Examples of miscellaneous charges are:

- Field clerk
- Switching
- In and out costs, snow removal, traffic control
- Rental of land for lay down space or storage of equipment
- Field office expenses
- Construction site security and alarm systems
- Temporary enclosures, special protection of materials
- Extended on-site storage requirements
- Construction management

5.7.2 Supervisory (formerly Account 093.8000)

In most projects tl1ere are supervisory costs, which are not directly chargeable to a specific Plant Unit Code. These cost, which are about 5% of tl1e direct construction cost, should be estimated separately and charged to the appropriate activity number (such as TC4405 or DC4405). The construction supervisors will charge tl1eir time to tl1ese activities.

5.8 Operation and Maintenance

Maintenance expense should be charged if project action is necessary to bring existing equipment to an adequate operating condition.

Operation and Maintenance expenses are estimated in the same detail as capital costs.

6.0 RETIREMENTS, COST OF REMOVAL AND SALVAGE

6.1 Retirements

Installed equipment, or a facility that will not be used or useful in its present location, or that has to be moved to provide for space for new equipment as a result of a capital project, can be treated in five different ways:

1. Removed and reinstalled at a different substation or plant location.
2. Removed and retained in plant at the Continuing Property Record (CPR) numbered location for spare equipment.
3. Removed and sold, junked, or returned to Stores.
4. Retired in place
5. Removed and reinstalled in a new location within the same substation or plant.

Cases 1 and 2 - For equipment (such as transformers, circuit breakers, reclosers, and regulators) whose installation cost is kept as a separate PUC, the original material cost will be transferred into the new plant location and the original installation cost will be retired. The new installation cost will be added when the equipment is installed. Costs required to remove the equipment from its original location and place it on a truck for transport to a new location are estimated as removal. Transportation costs to the new site are estimated as an O&M expense. For other equipment, the original installed cost will be transferred into the new plant location. Any costs required to reinstall these units of plant at a new location is estimated as an O&M expense. Testing is estimated as an expense.

Cases 3 and 4 - The project retirement figure would be the original cost of the equipment plus its original installation cost.

Case 5 - If the relocation within the same substation/plant does not result in a significant improvement or betterment, then the cost of relocation should be charged to expense. The original cost of installation and material will remain in the account. If the relocation does result in a significant improvement, the old installation cost (if carried in a separate PUC) is retired and the new installation cost is capitalized, while the material remains in the capital account. If material and installation costs are in the same PUC, costs for relocation are estimated as expense. Depreciated value is never used for the retirement figure on the estimate. The original cost of the equipment is always used.

6.2 Cost of Removal

All plant retirements have an associated cost of removal.

Cost of Removal activity numbers (such as DRxxxx and TRxxxx) should be charged by all departments involved in the removal work. This includes designers, engineers, construction, etc. Removals must not be charged as a capital activity.

If relocation of equipment within a facility does not result in a significant plant improvement, costs should be charged to expense. Temporary relocation to install another piece of equipment should be charged to the installation of the new equipment.

On projects requiring removal and disposal of transformers or capacitors, include in the cost of removal money to dispose of the oil and equipment itself if it contains PCB. The cost of removal should also include the testing to determine PCB levels.

The normal cost of excavation, disposal and backfilling associated with retirement and removal of a plant unit is estimated as Cost of Removal. Excess costs incurred because soil is contaminated are expense. Project engineers are strongly encouraged to review the nature of the work with the appropriate environmental engineer to ascertain whether any special accounts such as the Environmental Response Fund should be used for remediation activities.

6.3 Salvage

Supply Chain Management can provide the current salvage rates for scrap iron, copper and aluminum. The "Salvage" amount listed on the estimate represents the amount received from the scrap dealer for the material and not the net salvage amount determined by subtracting the cost of removal.